

**UNITED STATES OF AMERICA  
FEDERAL ENERGY REGULATORY COMMISSION**

Participation of Distributed Energy Resource	)	
Aggregations in Markets Operated by Regional	)	Docket No. RM18-9-000
Transmission Organizations and Independent	)	
System Operators	)	
	)	
Distributed Energy Resources-Technical	)	Docket No. AD18-10-000
Considerations for the Bulk Power System	)	

**Statement of David K. Owens  
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April 10-11, 2018 Technical Conference  
Panel 6: Coordination of DER Aggregations Participating in RTO/ISO Markets**

Good Afternoon, I am David Owens, retired Executive Vice-President at the Edison Electric Institute (“EEI”). I would like to thank the Commission for the opportunity to participate today and for providing a forum to discuss issues associated with the participation of distributed energy resource (“DER”) aggregations in Regional Transmission Organization (“RTO”) and Independent System Operator (“ISO”) markets, and to more broadly discuss the potential effects of distributed energy resources on the bulk electric system (“BES”). EEI recognizes the value and benefits that DERs, energy storage resources (“ESRs”) and other new technologies provide to the electric system.

I am here today to specifically discuss the coordination needed to address the implementation and operational issues associated with enabling DER aggregations to participate in the RTO/ISO markets. EEI would also note that many of the operational issues associated with participation of DER aggregations in the wholesale markets also applies to distribution-connected ESR participation in the wholesale markets. While distribution connected ESR resources were included in Order No. 841, as indicated in its Request for Rehearing, EEI asserts

that the operational issues associated with their participation in the wholesale markets should be addressed as part of this technical conference.

EEI is the association that represents all U.S. investor-owned electric companies. Our members provide electricity for about 220 million Americans, and operate in all 50 states and the District of Columbia. As a whole, the electric power industry supports more than 7 million jobs in communities across the United States. EEI's members are committed to providing affordable and reliable electricity to customers now and in the future.

EEI's diverse membership includes electric utilities operating in the energy markets operated by RTOs and ISOs and that own electric storage as well as other resources participating in the wholesale energy markets. EEI members also own and operate the distribution grid to which DERs and electric storage resources are interconnected or will seek to interconnect as they participate in the wholesale electric markets. As such, EEI members are directly affected by market rules and operational practices regarding the participation of DER aggregations in RTOs and ISOs and any potential effects DERs may have on the BES.

Electric distribution utilities ("EDUs") are transitioning to a new, technological, business and social environment largely defined by advances in technology and the desire for a more customer-driven, distributed, clean energy future. As customers become active participants in both managing and generating power, electric power companies are focusing on developing and improving, through state jurisdictional processes, the critical infrastructure to support all customers' electricity needs. While some regions are moving forward with market rules and beginning to upgrade infrastructure to accommodate the participation of distribution-connected ESRs and DERs in the wholesale markets, the levels of distribution-connected resource penetration and the system upgrades needed to integrate DERs resources and maintain reliability

are not uniform across the country. In most, if not all regions, the investments in infrastructure, technology, and resources still need to be made to support large numbers of distribution-connected resources participating in the wholesale markets.

Due to these challenges and differences among the regions, in its comments in response to the NOPR, EEI requested that the Commission allow RTOs/ISOs to progress at their own pace rather than mandating a requirement on all RTOs/ISOs to allow DER aggregations to participate in the wholesale markets or, at a minimum, to hold a technical conference to gather additional information to determine if the requirement should be mandated on all RTOs and ISOs. As such, EEI appreciates the Commission convening this technical conference to discuss the complexities and costs associated with allowing DER aggregations to participate in the wholesale market.

With respect to the specific issues raised for discussion on the coordination needed to integrate DERs (as well as other distribution connected ESRs) into the wholesale markets, I would like to focus on three issues:

- (1) The need to maintain reliability and security of the distribution system;
- (2) The need to address infrastructure investment and cost allocation; and
- (3) The need for communication and transparency between the EDU, RTO/ISO, transmission owner, DERs and the DER aggregator.

#### **1. Reliability and security of the distribution system must be maintained.**

EDUs are responsible for maintaining and reliably operating the distribution system, which includes providing all customers with reliable electric service at just and reasonable rates, meeting reliability requirements, modernizing and replacing infrastructure as needed, accommodating new technologies, meeting public policy requirements, and enhancing grid security. The challenges and complexity associated with meeting these goals increase as more distributed resources interconnect to the grid. Allowing distribution-connected resources to

participate in the wholesale markets has significant implications for the operation and reliability of the distribution system. For example, increased size and regularity of bidirectional flows could intensify the wear and tear on voltage regulation equipment, line regulators, and switching capacitors that are required to maintain power quality and frequency bandwidth. To address these issues, EDUs need to have visibility and input/control over resources that are integrated into the distribution system.

Although the transmission and distribution systems are interconnected, they are distinct systems with different structures, characteristics, functions, and operating principles. This is driven in large part by their different functions. The transmission system is a “meshed” network that enables the injection and withdrawal of energy at multiple points of the network. It is better designed to handle contingencies if an element such as a generator, transmission line, substation or other components fail. In contrast, most distribution grids have a radial or “branched” design, intended to deliver power in one direction to end-use customers. In contrast to the transmission system, the distribution system is necessarily reconfigured by switching distribution circuits to respond to planned outages and unplanned outages that can occur daily due to weather, animals, failed equipment, and even cars hitting poles. These reconfigurations happen routinely, even on “blue-sky” days, and change the topology of the system, and therefore how energy flows.

The distribution grid was originally designed to accommodate control and operation of one-way power flows from central station generation to customers. Historically, system engineers planned and controlled placement of generation resources, and local control over the operation of these resources allowed system operators to ensure the provision of power and essential reliability services when and where they were needed. With the increased interconnection of DERs on distribution networks, traditional resource control becomes

increasingly difficult and complex to manage for both those responsible for the BES and those responsible for operating underlying distribution networks. To maintain distribution system reliability, the EDU must know which resources are interconnected to the grid, their location, current capabilities and attributes, as well as detailed information on affected distribution lines. Many, if not most, EDUs currently lack or have very limited visibility into the operation of all technologies integrated within their distribution networks and may not have the necessary information about interconnected DERs and their capabilities. This lack of visibility creates reliability challenges, which, at some level of DER penetration, could extend to the interstate bulk transmission system. Data that is validated in real time, along with dynamic line loading on distribution feeders could provide the visibility that EDUs need to react and respond to critical events with a level of efficiency and accuracy that may be unavailable to them now. For those utilities that already have visibility of DER resources connected to the distribution system, with the introduction of a DER aggregator and the control/commitment of dispatch coming from the RTO/ISO, they may lose this visibility. That is, without being included in the coordination and operation of DER aggregators participating in RTO/ISO markets, EDUs will be unaware of how the DERs within an aggregation may be dispatched to meet RTO/ISO commitments.

Security issues, including cyber-security, will also need to be addressed. DERs participating in the wholesale markets increase the potential for BES attacks because they add to the number of interconnection points, increasing the attack surface for the BES. Meanwhile, security threats to the reliability of the BES continue to evolve. While there are not uniform mandatory security requirements for the distribution system and distribution-connected resources, states and EDUs have begun addressing these issues.

If the Commission chooses to allow DER aggregators and distribution-connected resources to participate in the wholesale markets, it must ensure that EDU's have transparency and control over the resources connected to its distribution system. The Commission asks if the RTO/ISO should allow the EDU to review the individual resources that are located on their distribution system that enroll in a DER aggregation and if it is appropriate for the EDU to have a role in whether and when the individual DER can participate. The answer to these questions is yes.

The EDU must be notified if a resource that is connected to its distribution system joins a DER aggregation and the EDU must consent to allowing that resource to participate in the DER aggregation. EDUs must be made aware of all information necessary to safely and reliably maintain the distribution system. If it is found that allowing a resource to participate in the aggregation would have adverse impacts on the distribution grid, then the EDU must be able to restrict that resource's participation until the system is upgraded to address the issue. EDUs must be made aware of all planned injections and maintain disconnect authority so that they can safely maintain the system. EDUs must also be notified of any changes in the aggregations, including the composition thereof, and aggregations that cease to exist, as these changes will impact electricity flows over the grid, and therefore operation and reliability of the distribution grid. EDUs must also be able to disallow participation of resources during periods of system reconfiguration due to distribution contingencies. These types of actions would help ensure that EDUs have the information necessary to maintain reliability on the distribution system as distribution connected resources seek to participate in the wholesale markets.

In addition to aiding distribution reliability, including the EDUs in the coordination and operations of DERs may also benefit DER aggregators. For example, the EDU may be able to

provide information to DER aggregators necessary for them to effectively bid into RTO/ISO markets, such as distribution system conditions and any anticipated outages that may impact whether a DER can be dispatched to meet an RTO/ISO commitment.

## **2. Infrastructure and cost allocation issues need to be addressed.**

Demand response was the first behind-the-meter resource that the Commission allowed to participate in the wholesale markets on a large scale. Prior to their participation, substantial work was done by the RTOs and ISOs to ensure that metering and verification processes were in place. DERs pose greater infrastructure and verification challenges, than those presented by demand response resources, as they are creating bi-directional flows on the system and not simply choosing to use or not use energy. While DERs may provide many benefits to the system including avoided fuel and purchased power costs, and possibly deferred transmission and distribution investment in certain circumstances, they may also impose costs on the EDU and other customers by requiring infrastructure development or by shifting costs associated with the use of the system. These issues increase as DER aggregations participate in the wholesale markets as costs associated with metering infrastructure, distribution facilities and telemetry will increase as well as costs incurred by the EDU for the cost of IT and software, among others, that associated with management of DER market participation.

The question becomes who bears the cost of the infrastructure that will need to be installed at the distribution level to facilitate the DER's participation in the aggregation as well as the on-going system maintenance costs associated with equipment cycling due to the increase in bi-directional flows. These are complex issues and will require thoughtful solution and consideration of the specific regional needs and regulatory processes.

**3. There must be communication and transparency between the EDU, RTO/ISO, transmission owner, DERs and the DER aggregator.**

As DER penetration increases in the future, it will be important to explore ways to advance operational short-term forecasting of DER activity at sufficient temporal and geographic granularity to meet the operational needs of both the distribution and the BES. There has been a growing need for improved coordination between the EDU and the RTO/ISO and this need only increases with the expected proliferation of DER sales into the wholesale market. For DERs participating in the wholesale market, there are several entities that are directly involved: the RTO/ISO, the EDU, transmission owner, which in some cases may not be the EDU, DERs and the DER aggregators.

While, currently, the RTO/ISO communicates with the transmission owner, there is no direct communication between the RTO/ISO and the EDU in its role as distribution system operator. As DER resources seek to participate in the wholesale markets, coordination between the RTO/ISO and the transmission owner will necessarily remain, but RTO/ISO coordination on operational matters associated with the distribution system will require direct communication between the RTO/ISO and the EDU through well-defined communications protocols.

Accordingly, EEI agrees with the proposal in the NOPR that each RTO/ISO should establish a process for ongoing coordination, including operational coordination, among the RTO/ISO, the EDU, DERs, and the DER aggregator. However, in many aspects, the NOPR proposal may not go far enough in terms of the information sharing as it does not require the DER aggregator to provide all the information to the EDU that may be needed by the EDU. For example, the DER aggregator should be required to communicate all information related to offered quantity and related distribution factors not only to the RTO/ISO, as proposed in the NOPR, but also to the EDU so that the EDU can assess impacts on the distribution system.



Similarly, there should be a process in place to allow EDUs to communicate distribution line faults and outages to DERs and the RTO/ISO to verify the information being provided by the DER aggregator. This one example demonstrates the need for communication among all three parties of all relevant information to ensure that reliability is maintained on both the distribution and transmission system. As such, there needs to be robust communication protocols in place so that the EDU is provided, or has access to, all information provided to the DER aggregator, to the RTO/ISO, and vice versa.

In determining what can or should be done to enhance communications and coordination flows to ensure reliable system operation of both the distribution system and the BES as numerous and more diverse DERs connect to the distribution system and seek to participate in the wholesale market, it is important to understand the roles and responsibilities of the RTO/ISO, the EDU, and the DER aggregator and the objectives that need to be met in providing the information. These may evolve over time. It will be necessary to specify the roles and responsibilities of the ISO, EDU, and DER aggregator in ensuring timely and accurate information is available to produce accurate short-term forecasts. The RTO/ISO needs predictability of DER responses to dispatch instructions at the transmission-distribution interface. The EDU needs to understand the current and predicted behavior of the DERs on its system to maintain reliability and safety and to plan its system accordingly. The information that the EDU requires will depend on locational, granular, short-term forecasting. As previously noted, the EDU must have the ability to modify the DER's behavior to maintain reliable operation.

To meet these objectives, energy market communication systems will need to be developed to provide the two-way communications necessary to address scheduling, forecasting,

and real-time dispatch issues. The processes and procedures that are developed need to fully inform the EDU of a DER aggregator's bids and RTO/ISO dispatches, and provide a process that allows the EDU to inform the RTO/ISO or DER aggregators of current distribution system conditions that could inhibit the DER from fully responding to RTO/ISO dispatch instructions. For example, to the extent they are known, EDUs should communicate distribution system conditions that will impact or prevent DER participation in the wholesale market as well as advisory information on system conditions (if and when such information exists) that constrain DER performance on an "ex ante" basis so that the DER may modify their ISO market bids accordingly. Similarly, the RTO/ISO should initiate processes that provide day-ahead DER schedules to the EDU so that the EDU can identify any impacts to current distribution system conditions or planned outages. It is the responsibility of the DER aggregator to determine availability. Exchange of these types of information will help ensure that the scheduling coordinator has sufficient information to assess potential impacts DER bids and dispatches have on the distribution system as well as how current conditions on the distribution system may render an RTO/ISO dispatch infeasible. If not addressed, these types of information and coordination gaps could create operational challenges that affect the reliability of the distribution system and the BES.

Just as there will be coordination agreements in place between the EDU and the RTO/ISO, there should also be an "integration agreement" between the EDU and the DER aggregator. The agreement would be executed prior to allowing the DER aggregator and the DERs in the aggregation to participate in the RTO/ISO markets. The agreement would specify, among other things, the responsibilities of the EDU and DER aggregator, including the DER aggregator's obligation to support the safety and reliability of the distribution system as a

condition for participation. Rather than imposing a format, the “integration agreement” should provide the flexibility needed to accommodate differences in distinctive regions.

The Commission asks if new processes and protocols are needed to ensure coordination among DER aggregators, EDUs, and RTOs/ISO during registration and if there should be a coordination agreement in place prior to participation of the DER aggregation in the RTO/ISO markets. As discussed herein, the answer is yes. Any operating and communication gaps between the EDU interconnection agreements and RTO/ISO tariffs should be identified and addressed prior to allowing DERs to participate in the wholesale markets. Significant coordination will be required to facilitate DER participation in the wholesale market and a transparent process should be in place, prior to participation, that outlines the respective roles and responsibilities of the EDU, RTO/ISO, transmission operator, DERs and DER aggregator. EEI would note that due to the jurisdictional issues involved, coordination will also be needed between the Commission and state regulatory authorities to ensure that jurisdictional and cost allocation issues are addressed.

**In conclusion,** I appreciate the opportunity to participate in this technical conference as it provides a needed forum to discuss the important issues associated with allowing not only DER aggregation but all distribution-connected resources to participate in the wholesale market. EEI would urge the Commission not to rush this important process and to allow RTOs/ISOs and EDU the time needed to install infrastructure, address cost allocation issues and to develop the communication and operational processes needed to maintain reliability on the distribution system and the BES. RTOs and ISOs should be allowed to proceed at their own pace as DER penetration and infrastructure deployment is not the same across the country.

In addition, allowing distribution-connected resources to participate in the wholesale market further interconnects the distribution and transmission system and should be done in a manner that respects the jurisdiction of the state over the distribution system and the needs of the EDU and the RTO/ISO as they seek to maintain reliability. While EEI appreciates the Commission's interest in removing barriers to resources that are technically capable of participating in the RTO/ISO markets, this must be done in a manner that respects the distribution system and the customers not participating in the wholesale market. Due to the complexity of the issues, EEI would urge the Commission to continue to allow RTOs and ISOs to address the cost-allocation and implementation issues associated with allowing distribution connected resources to participate in the wholesale markets and file tariff changes with the Commission when appropriate rather than imposing a requirement on all RTOs and ISOs.